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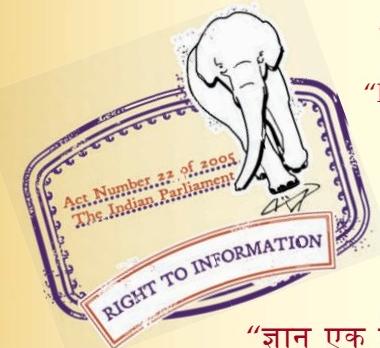
“Step Out From the Old to the New”

IS 6759 (1996): Radio receivers for frequency modulation broadcast transmission [LITD 7: Audio, Video and Multimedia Systems and Equipment]

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Satyanaaran Gangaram Pitroda

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**“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”**

Bhartṛhari—Nītiśatakam

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रेडियो रिसीवर – विशिष्टि  
( पहला पुनरीक्षण )

*Indian Standard*

RADIO RECEIVERS FOR FREQUENCY  
MODULATION BROADCAST  
TRANSMISSIONS — SPECIFICATION  
( *First Revision* )

ICS 33.160.20

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BUREAU OF INDIAN STANDARDS  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

## FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Radio Communications Sectional Committee had been approved by the Electronics and Telecommunication Division Council.

This Indian Standard was first published in 1972 and is being revised in view of the developments in the radio receiver industry in India and in the light of experience gained in actual testing of these receivers.

The object of this standard is to lay down general and performance requirements of radio receivers for frequency modulation broadcast transmissions. The limits of performance have been so chosen as to be a general guidance for manufacturer of such receivers and at the same time to ensure sufficient freedom in design.

This standard covers requirements of radio receivers for frequency modulation broadcast transmissions. The requirements of radio receivers for amplitude modulation broadcast transmission are covered in IS 615 : 1995.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS 2 : 1960 'Rules for the rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

## *Indian Standard*

# RADIO RECEIVERS FOR FREQUENCY MODULATION BROADCAST TRANSMISSIONS — SPECIFICATION *(First Revision)*

## **1 SCOPE**

**1.1** This standard covers general requirements and the minimum performance requirements for radio receivers designed for reception of frequency modulation broadcast transmissions with a peak deviation of 75 kHz and pre-emphasis of 50  $\mu$ s.

**1.2** This standard also covers the frequency modulation section of AM/FM radio receivers.

**1.3** This standard does not cover car radios, pocket size and headphone radio receivers.

## **2 REFERENCES**

The Indian Standards listed in Annex A are necessary adjuncts to this standard.

## **3 TERMINOLOGY**

For the purpose of this standard, the definitions and explanation of terms included in IS 12193 (Part 1) : 1989 shall apply.

## **4 GENERAL REQUIREMENTS**

**4.1** The cabinet shall be made of wood, moulded plastic or any other suitable material. The design of the cabinet shall be such as to provide for the receiver, reasonable protection from dust.

**4.2** The loudspeaker shall form an integral part of the receiver, either within the same cabinet or the receiver or in a separate cabinet.

**4.3** The layout of components, wiring, soldering and workmanship shall conform to good engineering practice.

### **4.4 Efficiency of the Receiver**

The receiver shall not draw more than 40 mA current with volume control in zero position (under quiescent conditions) irrespective of power supply system (batteries or mains).

## **5 SAFETY REQUIREMENTS**

**5.1** The main operated receivers shall conform to the following safety requirements tested in accordance with IS 616 : 1986.

- a) Heating under normal operating conditions (see 7 of IS 616 : 1986)
- b) Shock hazard under normal operating conditions (see 9 of IS 616 : 1986)
- c) Insulation requirements (see 10 of IS 616 : 1986)
- d) Fault conditions (see 11 of IS 616 : 1986)
- e) Parts connected to mains supply (see 13 of IS 616 : 1986)

## **6 PERFORMANCE REQUIREMENTS**

### **6.1 General**

#### **6.1.1 Ease of Reading**

The ease of reading of the dial averaged over the entire band shall not be less than 0.3 mm per 100 kHz for a dial of 70 mm.

#### **6.1.2 Calibration Error**

The calibration error shall not exceed  $\pm 6$  percent in all the frequency ranges.

#### **6.1.3 Power Supply**

In case of mains operated receivers, the receiver shall be designed to operate on a nominal supply system of 240 volts, 50 Hz, single phase ac, with a variation of  $\pm 10$  percent in voltage and  $\pm 2$  percent in frequency. In case of battery operated receivers, the receivers shall be designed to operate on a battery supply voltage recommended by the manufacturer.

#### **6.1.4 Antenna**

The receiver shall be designed for operation either with an internal built-in antenna or with an external antenna.

### **6.2 Frequency Range**

The receiver shall be designed for reception in the frequency range of 87.5 MHz to 108 MHz.

### **6.3 Intermediate Frequency**

The nominal intermediate frequency shall be 10.7 MHz  $\pm$  80 kHz.

### **6.4 Noise Limited Sensitivity**

The noise limited sensitivity over the entire frequency range shall be less than 10  $\mu$ V at a signal-to-noise ratio of 26 dB.

## 6.5 Selectivity

The single signal selectivity shall be better than 30 dB at  $\pm 300$  kHz.

## 6.6 AM Suppression Ratio

The AM suppression ratio shall be better than 20 dB for a signal level range of 100  $\mu$ V to 1 mV.

## 6.7 Output Power

The maximum useful output power shall not be less than maximum 100 mW.

## 6.8 Image, IF and Spurious Response Ratio

### 6.8.1 Image Ratio

The image ratio shall not be less than 20 dB.

### 6.8.2 IF Ratio

The IF ratio shall not be less than 40 dB.

### 6.8.3 Spurious Response Ratio — Under consideration.

## 6.9 Fidelity

### 6.9.1 Electrical Frequency Response

The variation in the overall electrical frequency response in the frequency range 100 Hz to 5 kHz shall not exceed 6 dB (when referred to response at 1 kHz) after allowing for 50  $\mu$ s pre-emphasis characteristics provided at the transmission end.

NOTE — A de-emphasis filter of 50  $\mu$ s of characteristics corresponding to that use in the transmitter may be incorporated for achieving this requirement.

### 6.9.2 Acoustical Frequency Response (Optional)

The variation in acoustical response in the frequency range 200 Hz to 5 000 Hz shall not exceed 15 dB.

## 6.10 Radio Interference Limits

The limits for radio interference from the FM receivers shall conform to the requirements specified in IS 6842 : 1972. Measurement of radio interference shall be made in accordance with IS 4546 : 1983.

## 6.11 Distortion

The distortion shall be less than 5.0 percent for a frequency deviation varying between  $\pm 15$  kHz (corresponding to 20 percent modulation) and  $\pm 75$  kHz (corresponding to 100 percent modulation) with a modulation frequency of 1 kHz at the input signal level of 100  $\mu$ V.

## 6.12 Acoustic Feed Back — Under consideration.

## 6.13 Frequency Stability

### 6.13.1 Warm-up Stability

The frequency stability during the warm-up period shall not exceed 500 parts per million at the end of one hour period.

## 6.13.2 Drift Due to Supply Voltage Variation

In the case of mains operated receivers, the frequency drift due to power supply variation shall be less than 0.1 percent.

## 7 MARKING

7.1 Each receiver shall be legibly and indelibly marked with the following information:

- a) Model designation and serial number;
- b) Manufacturer's name or trade-mark;
- c) Country of manufacture;
- d) Input supply voltage and type of batteries in the case of battery operated receivers;
- e) Frequency, if ac;
- f) Antenna input terminals, with impedance value, if provided; and
- g) External speaker terminals, if provided.

## 7.2 BIS Certification Marking

7.2.1 The receivers may also be marked with the Standard Mark.

7.2.2 The use of Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and Rules and Regulations made thereunder. Details of conditions under which a licence for the use of Standard Mark may be granted to manufacturers and producers may be obtained from the Bureau of Indian Standards.

## 8 TESTS

### 8.1 Classification of Tests

#### 8.1.1 Type Tests

The following tests shall constitute the type tests:

- a) Ease of reading (6.1.1),
- b) Noise limited sensitivity (6.4),
- c) Selectivity (6.5),
- d) Output power (6.7),
- e) Electrical frequency response (6.9.1),
- f) Acoustical frequency response (6.9.2),
- g) Image ratio (6.8.1),
- h) IF ratio (6.8.2),
- j) Spurious response ratio (6.8.3),
- k) Frequency stability (6.13),
- m) Distortion (6.11), and
- n) AM suppression ratio (6.6).

#### 8.1.1.1 Number of samples

For type tests, three receivers of the same model, type and make shall be selected preferably at random from a regular production lot.

#### 8.1.1.2 Criteria of acceptance

There shall be no single failure in any of the type tests.

**8.1.2 Routine Tests**

The following shall constitute the routine tests and shall be carried on each and every receiver.

- a) Functional check — There shall be no audible rattling or buzzing while listening at nominal volume control;
- b) Output power ( 6.7 );
- c) Noise limited sensitivity ( 6.4 ); and
- d) Distortion ( 6.11 ).

**8.1.3 Acceptance Tests**

The following shall constitute acceptance tests which shall be carried on receivers that have successfully passed the routine tests:

- a) Selectivity ( 6.5 ),
- b) Electrical Frequency Response ( 6.9.1 ),
- c) Image Ratio ( 6.8.1 ),
- d) IF Ratio ( 6.8.2 ),
- e) Spurious Response Ratio ( 6.8.3 ), and
- f) Frequency Stability ( 6.13 ).

**8.2 Environmental Tests**

**8.2.1** The receivers shall be capable of withstanding following environmental tests at the severities indicated therein. The post measurements specified in **8.2.2** shall be carried out after each environmental test and shall meet the requirements stated in the standard.

**a) Dry Heat Test**

Test method : In accordance with IS 9000 (Part 3/Sec 5) : 1977

Severity : 55°C for 16 h

Recovery period : 2 h

**b) Damp Heat Cyclic Test**

Test method : In accordance with IS 9000 (Part 5 /Sec1) : 1981

No. of cycles : 2

Recovery period: 24 h

**c) Cold Test**

Test method : In accordance with IS 9000 (Part 2/Sec 4) : 1977

Severity : - 10°C for 2 h

Recovery : 2 h

**d) Bump Test**

Test method : In accordance with IS 9000 (Part 7/ Sec 2) : 1979. The receivers shall be tested in packed condition

No. of bumps : 1 000 at 400 m/s<sup>2</sup>

**e) Drop Test**

Test method : In accordance with IS 9000 (Part 7/ Sec 3) : 1979. The receiver shall be tested under unpacked conditions

Height of drop: 25 mm

**8.2.2 Post measurement after each environmental test :**

- a) Noise limited sensitivity,
- b) Output power,
- c) Frequency stability, and
- d) Distortion.

**8.3 Measurement of Performance**

**8.3.1** The characteristics specified in this standard shall be measured in accordance with the procedures laid down in IS 12193 (Part 1) : 1989 and IS 12193 (Part 3) : 1994.

**8.3.2** The performance requirements specified in this standard refer to normal voltage operation in case of mains-operated receivers and to reduced voltage operation in case of battery-operated receivers.

## ANNEX A

( Clause 2 )

## LIST OF REFERRED INDIAN STANDARDS

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
615 : 1995	Radio receivers for amplitude modulation broadcast transmissions—specification ( <i>second revision</i> )	9000 (Part 5/ Sec 1) : 1981	Basic environmental testing procedures for electronic and electrical items: Part 5 Damp heat (cyclic) test, Section 1 16 + 8 h cycle
616 : 1986	Safety requirements for mains operated electronic and related apparatus for household and similar general use ( <i>second revision</i> )	9000 (Part 7/ Sec 2) : 1979	Basic environmental testing procedures for electronic and electrical items: Part 7 Impact test, Section 2 Bump
4546 : 1983	Methods of measurement of radiated and conducted interference from receivers for amplitude modulation, frequency modulation and television broadcast transmissions ( <i>first revision</i> )	9000 (Part 7/ Sec 3) : 1979	Basic environmental testing procedures for electronic and electrical items: Part 7 Impact test, Section 3 Drop and topple
6842 : 1972	Specification for limits for electromagnetic interference ( <i>first revision</i> )	12193 (Part 1) : 1989	Methods for measurement for radio receivers for various classes of emission: Part 1 General considerations and methods of measurements
9000 (Part 2/ Sec 4) : 1977	Basic environmental testing procedures for electronic and electrical items: Part 2 Cold tests, Section 4 Cold test for heat dissipating items with gradual change of temperature	12193 (Part 3) : 1994	Methods for measurement for radio receivers for various classes of emission: Part 3 Radio frequency measurements on receivers for frequency modulated sound broadcast emissions
9000 (Part 3/ Sec 5) : 1977	Basic environmental testing procedures for electronic and electrical items: Part 3 Dry heat test, Section 5 Dry heat test for heat dissipating items with gradual change of temperature		

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### Amendments Issued Since Publication

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## BUREAU OF INDIAN STANDARDS

### Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002  
Telephones : 323 01 31, 323 83 75, 323 94 02

Telegrams : Manaksansta  
(Common to all offices)

### Regional Offices :

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg  
NEW DELHI 110002

Telephone

{ 323 76 17  
    323 48 41

Eastern : 1/14 C. I.T. Scheme VII M, V. I. P. Road, Maniktola  
CALCUTTA 700054

{ 37 84 99, 37 85 61  
    37 86 26, 37 91 20

Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022

{ 60 38 43  
    60 20 25

Southern : C. I. T. Campus, IV Cross Road, MADRAS 600113

{ 235 02 16, 235 04 42  
    235 15 19, 235 23 15

Western : Manakalaya, E9 MIDC, Marol, Andheri (East)  
BOMBAY 400093

{ 832 92 95, 832 78 58  
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